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Serial No.: 10/676,324

Confirmation No.: 6481

Filed: September 30, 2003

For: PRODUCTION OF HYDROGEN FROM ALCOHOLS

Remarks

The Office Action mailed January 30, 2006 has been received and reviewed. Claims 1, 18, 28, 35, and 42 having been amended, the pending claims are claims 1-24, 26-33, 35-40, and 42-50.

Support for the amendment to claims 1, 18, 28, 35, and 42 may be found in the specification at, for example, page 17, lines 27-29. No new matter has been added as a result of the amendment of these claims.

Reconsideration and withdrawal of the rejections in view of the above amendments and the following comments are respectfully requested.

The 35 U.S.C. §102 Rejection

The Examiner rejected claims 1-7, 13-17, 20, 21, 42-45, and 50 under 35 U.S.C. §102(b) as being anticipated by Maruko (CA 2323728). Applicants respectfully traverse this rejection.

It is well established that to sustain a rejection under 35 U.S.C. §102(b), a single prior art reference has to teach every element of the claimed invention. Applicants assert that Maruko does not teach every element of the rejected claims. Therefore, the rejection should be withdrawn.

Claims 1-7, 13-17, 42-45, and 50

Applicants' independent claims 1 and 42 (as amended) each recite a process for the production of hydrogen that includes forming a film of a composition comprising at least one alcohol comprising at least 2 carbon atoms on a wall of a reactor; vaporizing the composition; and contacting the composition with a stratified catalyst. Applicants assert that Maruko fail to teach or suggest the claimed process.

Maruko teaches "[a]n auto-oxidation and internal heating type reforming method and apparatus for hydrogen production" (Maruko, abstract). Applicants assert that Maruko does not

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teach forming a film of a composition comprising at least one alcohol comprising at least 2 carbon atoms on a wall of a reactor.

Thus, neither independent claims 1 and 42, nor claim 2-7 and 13-17, dependent on claim 1, and claims 43-45 and 50, dependent on claim 42, are anticipated by Maruko.

Furthermore, with respect to claims 6 and 7, the Examiner stated in the Office Action mailed 30 January 2006, page 2, last paragraph, that Maruko "teaches that the catalyst bed in general is maintained in the range of 700-800°C." Applicants respectfully point out that ranges of 700-750°C and 750-800°C (e.g., Maruko, page 4 line 7 and page 6, lines 15-16, respectively) refer to reforming reaction temperatures of hydrocarbons. Thus, Maruko does not teach reforming of alcohols at temperatures of 700-800°C, as suggested by the Examiner at page 2, last paragraph of the present Office Action mailed 30 January 2006.

Claims 20 and 21

The Examiner rejected claims 20 and 21 as being anticipated by Maruko. Applicants respectfully point out, however, that claims 20 and 21 are both dependent claims that are dependent upon claim 18, and claim 18 was not rejected as anticipated by Maruko. Applicants agree that claim 18 is not anticipated by Maruko. Thus, Applicants believe that claims 20 and 21 were erroneously indicated as rejected under 35 U.S.C. §102(b) by Maruko. Clarification, as well as withdrawal of the rejection of claims 20 and 21 are respectfully requested.

Furthermore, claim 18 (as amended) contains the same recitations as noted for claims 1 and 42, namely forming a film of a composition (claim 1) or feed gas (claim 42) comprising at least one alcohol comprising at least two carbon atoms on a wall of a reactor; vaporizing the composition or feed gas; and contacting the composition or feed gas with a catalyst. Thus, claim 18, as well as dependent claims 20 and 21 are not anticipated for similar reasons as discussed above.

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For at least the above reasons, Applicants respectfully submit that claims 1-7, 13-17, 20, 21, 42-45, and 50 are not anticipated by Maruko. Reconsideration and withdrawal of the rejection are respectfully requested.

The 35 U.S.C. §103 Rejection

The Examiner rejected claims 14, 18-19, 21, 26-30, and 35-27 under 35 U.S.C. §103(a) as being unpatentable over Maruko (CA 2323728) as applied to the claims above. Applicants respectfully traverse this rejection.

In order to establish a *prima facie* case of obviousness, the Examiner must establish that there is a motivation to combine the documents (or modify the teachings of a document) to achieve the claimed invention, with a reasonable expectation of success. Further, the references must teach or suggest every element of the claimed invention. For at least the reasons set forth below, it is respectfully submitted that the Examiner has failed to make the requisite showing of a *prima facie* case of obviousness.

Applicants disagree with the Examiner's assertion that it would be obvious, in view of Maruko's teaching of alcohol reforming reactions as low as 250-350°C, for the skilled person to determine, by routine skill in the art, to supply the feed gas at a temperature of no greater than 160°C prior to contact with the catalyst, as recited in Applicants' claims. In addition, Applicants respectfully assert that the claims are also nonobvious over Maruko for the following reason.

As pointed out above, Applicants submit that Maruko fail to teach a process for the production of hydrogen wherein a film of a composition comprising at least one alcohol comprising at least 2 carbon atoms is formed on a wall of a reactor. Further, the specification of Maruko teaches "flowing" the gaseous mixture through, *inter alia*, the reforming reaction and high temperature shift catalysts. The figures (e.g., Figures 1-3 and 5) include arrows showing the direction of flow of the gaseous mixture, none of which suggest that the gaseous mixture is directed to a wall of a reactor, wherein a film is formed. Thus, there is no suggestion provided in

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Maruko of forming a film of a composition comprising at least one alcohol comprising at least 2 carbon atoms on a wall of a reactor.

Reconsideration and withdrawal of the rejection of claims 14, 18-19, 21, 26-30, and 35-27 as being obvious over Maruko et al. are respectfully requested.

The Examiner rejected claims 8-12, 22-24, 31-33, 38-40, and 46-69 under 35 U.S.C. §103(a) as being unpatentable over Maruko as applied to the claims above and further in view of Anzai et al. (US 2003/0060364 A1). Applicants respectfully traverse this rejection.

For at least the reasons provided above, Applicants assert that Maruko fail to teach or suggest the formation of a film of a composition comprising at least one alcohol comprising at least 2 carbon atoms on a wall of a reactor. Applicants additionally assert that Anzai et al. fail to provide that which is missing from Maruko.

Anzai et al. teach "[a]utothermal reforming catalysts compris[ing] rhodium supported on a support containing 5 to 40 percent by mass of a cerium oxide or rare earth element oxide which is composed principally of a cerium oxide, 60 to 95 percent by mass of an aluminum oxide, and 0 to 10 percent by mass in terms of metal of one or more elements selected from the group consisting of an alkaline metal and an alkaline earth metal, the atomic ratio of cerium and rhodium (Ce/Rh) being 1 to 250" (Anzai et al., abstract). A gas feedstock is pre-heated to a predetermined temperature, mixed with steam and air, and introduced into a reactor filled with the catalyst (Anzai et al., paragraph [0048]). There is no teaching or suggestion that a film of a composition comprising at least one alcohol comprising at least 2 carbon atoms is formed on a wall of a reactor. Thus, Anzai et al. do not supply that which is missing from Maruko.

Reconsideration and withdrawal of the rejection of claims 8-12, 22-24, 31-33, 38-40, and 46-69 as obvious over Maruko in view of Anzai et al. are respectfully requested.

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The Examiner rejected claims 1-24, 26-33, 35-40, and 42-50 under 35 U.S.C. §103(a) as being unpatentable over Anzai et al. in view of Hu et al. (U.S. Patent No. 5,597,771).

Applicants respectfully traverse this rejection.

In view of the above comments, Applicants assert that Anzai et al. fail to teach forming a film of a composition comprising at least one alcohol comprising at least 2 carbon atoms on a wall of a reactor. Hu et al., which teach a layered catalyst and methods of preparing same, teach only a method of use which includes "the step of contacting gas under conversion conditions (e.g., a temperature of about 100° to 950°C. of the inlet gas to the catalyst composition) with a catalyst composition" as described in Hu et al. (col. 22, lines 16-20). Furthermore, Example 10 of Hu et al. (col. 26, lines 37-51 and Tables II and III) merely describes contact of feed gas compositions with the catalysts to evaluate light-off performances and conversion efficiencies of the catalysts. There is no teaching or suggestion whatsoever of forming a film of a composition comprising at least one alcohol comprising at least 2 carbon atoms on a wall of a reactor, as recited in each of Applicants' independent claims 1, 18, 28, 35, and 42. Further, for at least the reason that each of Applicants' independent claims are nonobvious over Anzai et al. in view of Hu et al., Applicants' dependent claims 2-17, 19-24, 26, 27, 29-33, 36-40, and 43-50 are also non-obvious over Anzai et al. in view of Hu et al.

Reconsideration and withdrawal of the rejection of Applicants' claims 1-24, 26-33, 35-40, and 42-50 are, therefore, respectfully requested.

The Examiner rejected claims 1-24, 26-33, 35-40, and 42-50 under 35 U.S.C. §103(a) as being unpatentable over Anzai et al. in view of Maruko. Applicants respectfully traverse this rejection.

As discussed above, Applicants assert that the neither Anzai et al. nor Maruko teach forming a film of a composition comprising at least one alcohol comprising at least 2 carbon atoms on a wall of a reactor. As this feature is present in each of Applicants' claims, Applicants

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submit that the combination of Anzai et al. in view of Maruko fail to teach or suggest each element of the claims.

Reconsideration and withdrawal of the rejection of claims 1-24, 26-33, 35-40, and 42-50 as obvious over Anzai et al. in view of Maruko are respectfully requested.

Summary

It is respectfully submitted that the pending claims 1-24, 26-33, 35-40, and 42-50 are in condition for allowance and notification to that effect is respectfully requested.

The Examiner is invited to contact Applicants' Representatives at the telephone number listed below if it is believed that prosecution of this application may be assisted thereby.

Respectfully submitted

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CERTIFICATE UNDER 37 CFR §1.8:

The undersigned hereby certifies that the Transmittal Letter and the paper(s), as described hereinabove, are being transmitted by facsimile in accordance with 37 CFR §1.6(d) to the Patent and Trademark Office, addressed to Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 24th day of April, 2006, at

3:30 pm (Central Time).

By:

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